PATENT COOPERATION TREATY

From the INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

Prins, A. W.
VEREENIGDE
Nieuwe Parklaan 97
NL-2587 BN Den Haag
PAYS-BAS

8-2-05

- 2 SEP 2004

OCTROOIBUREAU

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	23.08.2004
Applicant's or agent's file reference MAP P61151PC00	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NL 02/00534	08.08.2002	08.08.2002

Applicant
TECHNISCHE UNIVERSITEIT DELFT

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Micheli, M Tel. +31 70 340-3606

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P61151PC00		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/NL 02/00534	08.08.2002	08.08.2002
International Patent Classification (IPC) or both national classification and IPC		
F16J3/06		
Applicant		
TECHNISCHE UNIVERSITEIT DELFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
28.11.2003	23.08.2004
Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Ingelgard, T. Telephone No. +31 70 340-2258

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL 02/00534

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-14 as originally filed

Claims, Numbers

1-16 received on 23.04.2004 with letter of 23.04.2004

Drawings, Sheets

1/24-24/24 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 5,6

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☒ no international search report has been established for the said claims Nos. 5,6

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-4, 7-16
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-4, 7-16
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-4, 7-16
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

There is an obvious error in the search report for application number PCT/NL 02/00534, issued 17 April 2003. In the continuation of Box I.2 it is stated that claims 3 and 4 could not be searched as the parameters used to define the geometry of the pressurisable structure makes a meaningful comparition with the prior art impossible. Comparing with the claims it is easy to realise that it is instead claims 4 and 5 that could not be searched as it is in those claims that the geometry is defined by parameters. Claim 3 concerns which part of the fibre that is in contact with the body. The search report also cites document US5385262 against claim 3, showing that claim 3 indeed has been searched.

Thus the correct statement is:
The parameters used in claim 4 and 5 to define the geometry of the pressurisable structure makes a meaningful comparison with the prior art impossible.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO when acting as an international Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not yet been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during a Chapter II procedure.

With the letter from the applicant dated 23.04.2004 a new set of claims are filed. The claims are renumbered and the former claims 4 and 5 now have the numbers 5 and 6.

Claims 5 and 6 are not examined in this preliminary examination report.

Re Item V
Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1:US-A-4 777 868 (LARSSON OVE) 18 October 1988 (1988-10-18)
D2:US-A-5 385 262 (COQUET PASCAL D ET AL) 31 January 1995 (1995-01-31)
D3:EP-A-0 626 338 (ZUMRO B V) 30 November 1994 (1994-11-30)

2 Clarity

The application does not meet the requirements of Article 6 PCT, because claims 3 and 4 are not clear.

The claims 3 and 4 are not clear as it is not stated when the fibre undergoes torsion respectively there is reversal of the side of the fibre which is in contact with the body. Is it during winding the fibre onto the body or is it when the finished structure is pressurised? Further lack of clarity is added as the shape of the fibre is not stated. Which sides are meant in claim 4?

3 Novelty and inventive step

3.1 The document D1 discloses (the references in parentheses applying to this document):

Fibre-reinforced pressurisable structure (12) comprising a gas-or fluid-tight body (claim 1) overwound with a number of fibre filaments (claim 1; column 2, line 7 - line 16), whereby the radius of the body varies with respect to a rotation-symmetric axis of the structure (all figures), such that said body comprises a number of concave surface sections each having a local minimum radius, and a number of convex surface sections each having a local maximum radius (all figures), whereby at least one concave surface section is overwound with a fibre (fig 1, 2, 3; column 2, line 7 - line 16; column 2, line 62 - line 66).

The subject-matter of claim 1 differs from this known structure in that the structure is overwound as an isotensoide and that the longitudinal orientation of the fibre along a finite length thereof is orientated substantially perpendicular with respect to the rotation

symmetrical axis of the structure.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to optimise the use of the fibre to improve the performance in terms of volume, pressure and mass can be obtained.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

If the person skilled in the art would try to combine the teachings of D1 and D3 (showing a pressurisable structure for use as an actuator having convex portions with large radius and concave section with zero radius having "more or less isotensoid fibres" (page 2 of D3)), still no isotensoidal structure would be obtained. (The advantage of the doubt is here given to the applicant.)

3.2 Claims 2-4 and 7-16 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

4 Industrial applicability

Claims 1-4 and 7-16 are industrially applicable.

5 Further remarks

5.1 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D2 and D3 is not mentioned in the description, nor are these documents identified therein.

5.2 The description is not adapted to the amended claims.

5.3 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Claims

1. Fibre-reinforced pressurizable structure comprising a gas- or fluid-tight body overwound as an isotensoide with a number of fibre filaments, whereby the radius of the body varies with respect to a rotation-symmetrical axis of the structure, such that said body comprises a number of concave surface sections spaced apart from the axial ends, each having a local minimum radius, and a number of convex surface sections spaced apart from the axial ends, each having a local maximum radius, characterized in that at least one concave surface section is overwound with a fibre such that the longitudinal orientation of the fibre along a finite length thereof is orientated substantially perpendicular with respect to the rotation-symmetrical axis of the structure.

2. Fibre-reinforced pressurizable structure according to claim 1, characterized in that the fluid-tight body is quasi-geodesically overwound in a continuous fashion.

3. Fibre-reinforced pressurizable structure according to claim 1 or 2, characterized in that the finite length of the fibre comprises a locus at which the fibre undergoes torsion with respect to its longitudinal centre-line.

4. Fibre-reinforced pressurizable structure according to claim 1 or 2, characterized in that the finite length of the fibre comprises a locus at which there is reversal of the side of the fibre which is in contact with the body.

5. Fibre-reinforced pressurizable structure according to any of claims 1-4, whereby a parameter called the q-factor is defined as the square of the dimensionless quotient of said local maximum radius of a convex surface section adjacent to the concave surface section in question and the local minimum radius of the concave surface section in question, and whereby a

dimensionless parameter called the r-factor is defined as the quotient of the total distribution of the external axial load on the circumference of said local minimum radius and the internal axial force generated by the internal pressure on the surface of the axial section at said local maximum radius, characterized in that when the q-factor and the r-factor of the body have values in the ranges of $q = \{1,8\}$ and $r = \{-1/q,-1/(2q)\}$, or $q = \{8, \infty\}$ and $r = \{0,-1/q\}$, there is reversal of the side of the fibre which is in contact with the concave surface section.

6. Fibre-reinforced pressurizable structure according to any of claims 1-4, whereby a parameter called the q-factor is defined as the square of the dimensionless quotient of said local maximum radius of a convex surface section adjacent to the concave surface section in question and the local minimum radius of the concave surface section in question, and whereby a dimensionless parameter called the r-factor is defined as the quotient of the total distribution of the external axial load on the circumference of said local minimum radius and the internal axial force generated by the internal pressure on the surface of the axial section at said local maximum radius, characterized in that when the q-factor and the r-factor of the body have values in the ranges of $q = \{1,12\}$ and $r = \{-1/q,0\}$, the fibre is in contact with the concave surface section in question with its one and same side throughout.

7. Fibre-reinforced pressurizable structure according to any of claims 1-6, characterized in that the body is flexible, i.e. non-rigid, and that the fibres are supported by a matrix material.

8. Fibre-reinforced pressurizable structure according to any of claims 1-7, characterized in that the axial length of at least one axial section of the structure is variable with respect to the longitudinal axis of the pressurizable structure.

9. Fibre-reinforced pressurizable structure according to any of claims 1-7, characterized in that at least one axial section of the structure is pivotable with respect to the longitudinal axis of the pressurizable structure.

10. Fibre-reinforced pressurizable structure according to any of claims 1-7, characterized in that at least one axial section of the structure is pivotable with respect to an axis, which axis is orthogonal with respect to the longitudinal axis of the pressurizable structure.

11. Fibre-reinforced pressurizable structure according to any of claims 8-10, characterized in that at least one axial section of the structure comprises a combination of at least two of the technical elements of said claims, e.g. in that at least one axial section of the structure is pivotable with respect to the longitudinal axis of the pressurizable structure and that the axial length of this axial section of the structure is variable with respect to the longitudinal axis of the pressurizable structure as in the case in which the pressurizable structure comprises a substantially hyperboloid shape.

12. Fibre-reinforced pressurizable structure according to any of claims 1-11, characterized in that the pressurizable structure comprises a one- to three dimensional arrangement of a number of pressurizable fuel tanks or pipelines.

13. Fibre-reinforced pressurizable structure according to any of claims 1-12, characterized in that the pressurizable structure comprises a spring means for a load-displacement function, preferably an adjustable load-displacement function.

14. Fibre-reinforced pressurizable structure according to any of claims 1-12, characterized in that the pressurizable structure comprises means for an actuating function, such as for elevators, excavators and industrial robots.

15. Fibre-reinforced pressurizable structure according to any of claims 1-12, characterized in that the pressurizable structure comprises means for a shoring or strutting function, such as construction beams.

16. Fibre-reinforced pressurizable structure according to claim 15, characterized in that the means for a shoring or strutting function, such as construction beams, are adaptable to the Eigen-frequencies of the pressurizable structure.